COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

AN INVESTIGATION OF SOUTH CENTRAL BELL TELEPHONE COMPANY, LESLIE COUNTY TELEPHONE COMPANY, INC. AND GTE SOUTH INCORPORATED	)	CASE NO. 94-390
ALLEGED FAILURE TO COMPLY WITH COMMISSION REGULATION 807 KAR 5:006	)	

O R D E R

South Central Bell Telephone Company ("SCB"), Leslie County Telephone Company, Inc. ("Leslie Co.") and GTE South Incorporated ("GTE") engage in the transmission or conveyance over wire, in air, or otherwise, of messages by telephone or telegraph for the public, for compensation, and are utilities subject to Commission jurisdiction. KRS 278.010.

KRS 278.280(2) directs the Commission to prescribe rules and regulations for the performance of service by utilities. Pursuant to this statutory directive, the Commission promulgated Commission Regulation 807 KAR 5:006, Section 26(1), which requires each utility, within two (2) hours following discovery, to notify the Commission by telephone or electronic mail of any utility related accident which results in actual or potential property damage of $25,000 or more, or loss of service for four (4) or more hours to ten (10) percent or five hundred (500) or more of the utility's customers, whichever is less. In addition, Section 26(2) requires

each utility involved in a utility related accident to submit to the Commission a summary written report within seven (7) calendar days of the accident.

Commission Staff has submitted to the Commission an Accident Report, with attachments, dated June 2, 1994 and appended hereto, which alleges:

1. At approximately 5:30 a.m. on April 16, 1994, a SCB microwave relay tower near the city of Jackson, Kentucky, collapsed, causing a loss of toll connections for the exchanges of Jackson (SCB); Buckhorn and Canoe (Leslie Co.); and Hazard, Leatherwood, and Vicco (GTE).

2. The service of approximately 4,224 SCB subscribers was affected by the collapse of the tower. SCB notified Wayne Bates of the Commission's staff of the accident sometime between 10:30 a.m. and 11 a.m. on April 17, 1994. SCB submitted to the Commission a summary written report of the accident on April 18, 1994.

3. The service of approximately 12,000 GTE subscribers was affected for about fourteen hours on April 16, 1994. GTE personnel had knowledge of the loss of toll service shortly after the collapse of the tower because toll circuits are equipped with automatic alarms which immediately notify central office personnel of a failure. On April 26, 1994, James R. Johnson of the Commission's staff telephoned Mr. Russ Cave of GTE to ask the effect that the loss of SCB's toll circuits had had in the Perry County area. Mr. Johnson also asked that GTE submit a written report of the accident to the Commission. On April 27, 1994, GTE

submitted a letter briefly describing the accident and its effect on GTE customers.

4. The service of approximately 1,529 Leslie Co. subscribers was affected until April 18, 1994. Leslie Co. personnel had knowledge of the loss of toll service shortly after the collapse of the tower because toll circuits are equipped with automatic alarms which immediately notify central office personnel of a failure. To date, Leslie Co. has not submitted to the Commission a written report of the accident.

Based on its review of the Accident Report and being otherwise sufficiently advised, the Commission finds that prima facie evidence exists that SCB, Leslie Co., and GTE have failed to comply with Commission Regulation 807 KAR 5:006, Section 26(1), and that Leslie County and GTE have failed to comply with Commission Regulation 807 KAR 5:006, Section 26(2).

The Commission, on its own motion, HEREBY ORDERS that:

1. SCB, Leslie Co., and GTE shall appear before the Commission on December 7, 1994 at 9:00 a.m., Eastern Standard Time, in Hearing Room 1 of the Commission's offices at 730 Schenkel Lane, Frankfort, Kentucky, for the purpose of presenting evidence concerning the violations alleged herein, and of showing cause why they should not be subject to the penalties prescribed in KRS 278.990(1) for these alleged violations.

2. SCB, Leslie Co., and GTE shall submit to the Commission, within 20 days of the date of this Order, a written response to the allegations contained in the Accident Report.

3. The Accident Report of June 2, 1994, a copy of which is appended hereto, is made part of the record of this proceeding.

4. Any motion requesting any informal conference with Commission Staff to consider any matter which would aid in the handling or disposition of this proceeding shall be filed with the Commission no later than 20 days from the date of this Order.

Done at Frankfort, Kentucky, this 3rd day of November, 1994.

PUBLIC SERVICE COMMISSION

Chairman

Vice Chairman

Commissioner

ATTEST:

Executive Director

ACCIDENT REPORT
SCB Tower Collapse

BRIEF

On April 17, 1994, sometime between 10:30 am and 11:00 am Mr. Fred Gerwing, of South Central Bell Telephone Company ("SCB"), telephoned the home of Wayne Bates, of the Commission's staff, to report that a microwave relay tower near the city of Jackson had fallen. The collapse of this tower caused the loss of toll connections for the exchanges of Jackson (SCB); Buckhorn and Canoe (Leslie Co. Telephone Company Inc. ("Leslie Co.")); and Hazard, Leatherwood and Vicco (GTE South, Incorporated ("GTE")) on April 16, 1994, at approximately 5:30 am. Mr. James Whitaker, Leslie Co., called Mr. Bates at approximately 11:20 am on April 18, 1994 to report the same incident. The loss of this tower and its associated microwave circuits caused approximately 17,753 subscribers in the affected exchanges to be unable to complete interexchange toll calls. Local calling service within each of the LECs' exchanges was not affected.

INVESTIGATION FINDINGS

On April 26, 1994 I telephoned Mr. Russ Cave, of GTE, and inquired about the effect that the loss of SCB's toll circuits had on the subscribers in the Perry County area. Mr. Cave replied that this was the first he had heard of it. Later the same day, Mr. Cave advised that approximately 12,000 GTE subscribers in the Hazard, Vicco and Leatherwood exchanges had local calling only for about 14 hours on April 16, 1994. The 12,000 GTE subscribers were without long distance calling capability from 5:30 am to 7:30 pm on April 16, 1994. GTE was able to restore its toll service by rerouting the affected circuits through its own facilities. Also, I advised that GTE should make a written report of the incident to the Commission in response to Mr. Cave's inquiry.

SCB, with the help of Mountain Rural Telephone Cooperative Corporation, Thacker-Grigsby Telephone Co., Mountaineer Cellular General Partnership and Leslie Co., was able to establish limited interexchange toll service on Monday, April 18, 1994. A temporary tower is being constructed at the site to restore service to a normal level, but ultimately a new fiber optic route is being planned as the replacement facility to carry the toll traffic to SCB's Winchester tandem office.

I made a visit to the site on April 20, 1994 and was accompanied by Mr. Morgan Coleman from the engineering department of SCB. The fallen tower rubble had been removed from the immediate vicinity, and construction of the temporary tower had started. An inspection of the six anchors revealed that the outer southeast anchor appeared to be in the vicinity of an earth slippage and that a large tree had fallen across the guy wires bending the anchor rod and applying abnormal pressure on the guy wire attached near the top of the 330 foot tower. The other anchors appeared to be undisturbed.

Photographs provided by SCB indicate that the tower collapsed upon itself in a scissor like manner. Conversations with workmen from SCB and AT&T's construction crew also indicated that the 330 foot tower fell within a radius of 100 to 150 feet of the base of the tower.

CONCLUSION

It appears that the tower collapsed as a result of the earth slippage and a tree falling on the guy wires applying excessive strain to the tower.

Submitted by,

James R. Johnson
Utility Inspector Sr.
Communications Branch

Reviewed by,

Wayne Bates, Manager
Communications Branch

Attachments:
1. Photographs
2. Initial Written Report from SCB
3. Preliminary Failure Evaluation by Law Engineering for SCB
4. Initial Written Report from GTE

COMMUNICATION UTILITY ACCIDENT INVESTIGATION

DATE OF THIS REPORT April 26, 1994 SUBMITTED BY James R. Johnson

NAME OF UTILITY South Central Bell Telephone Co.

ACCIDENT REPORTED BY Fred Gerwing

DATE AND TIME ACCIDENT OCCURRED April 16, 1994; 5:30 am

DATE & TIME UTILITY LEARNED OF ACCIDENT April 16, 1994; 5:30 am

DATE & TIME ACCIDENT REPORTED April 17, 1994; between 10:30 to 11:00am

DATE OF ACCIDENT INVESTIGATION April 20, 1994

DATE SUMMARY WRITTEN REPORT WAS RECEIVED FROM UTILITY April 18, 1994

PERSONS ASSISTING IN THE INVESTIGATION Mr.Morgan Coleman and Ms. Beth Ice of SCB

NAME OF VICTIM(S) 1. None SEX _____ AGE _____

FATAL _____ NAME OF EMPLOYER: _____

INJURIES _____

2. N/A SEX _____ AGE _____

FATAL _____ NAME OF EMPLOYER: _____

INJURIES _____

3. N/A SEX _____ AGE _____

FATAL _____ NAME OF EMPLOYER: _____

INJURIES _____

COMMUNICATION UTILITY ACCIDENT INVESTIGATION (Continued)

LOCATION OF ACCIDENT Jackson, Kentucky

DESCRIPTION OF ACCIDENT A 330 foot guyed steel tower collapsed causing the loss of microwave circuits which provided toll connections for SCB, Leslie Co., and GTE. The probable cause of the collapse was an earth slippage and a large tree falling on a supporting guy wire applying abnormal stress to the tower. The lost toll circuits affected approximately 12,000 GTE subscribers in the Hazard, Leatherwood and Vicco exchanges for approximately 14 hours on April 16, 1994. GTE was able to restore toll service to its subscribers by rerouting circuits through its own facilities. The toll loss affected 4,224 SCB subscribers in the Jackson Exchange and 1,529 Leslie Co. subscribers in the Buckhorn and Canoe exchanges until April 18, 1994. GTE and Leslie Co. personnel had knowledge of the loss of toll service within a short period of time after the collapse of the tower because toll circuits are equipped with automatic alarms which immediately notify central office personnel of a failure.

SOURCE OF INFORMATION Mr. Wayne Bates, PSC; Ms. Beth Ice and Mr. Mr. Morgan Coleman, SCB; Mr. Russ Cave, GTE; Mr. Don Roark, Leslie Co.

PROBABLE VIOLATIONS OF COMMISSION REGULATIONS Failure of SCB, GTE and Leslie Co. to report property damage or loss of service within two (2) hours following discovery, 807 KAR 5:006, Section 26 (1). Failure of GTE and Leslie Co. to provide a summary written report to the Commission within seven calendar days, 807 KAR 5:006 Section 26 (2).

RECOMMENDATIONS It is recommended the Commission consider action in accordance with KRS 278.990 for GTE's, SCB's and Leslie Co.'s probable violation of the Commission Regulations as noted above.

CORRECTIVE ACTION SCB, with the cooperation of Mountain Rural Telephone Coop., Thacker-Grigsby TelCo., Mountaineer Cellular and Leslie Co., was able to establish limited toll service on April 18, 1994. A temporary tower was constructed to reestablish the microwave route and SCB is planning a fiber optic circuit to be the permanent facility to replace the interrupted toll circuits.

LINE CLEARANCES

	As Measured	Minimum Allowed by NESC
A. AT POINT OF ACCIDENT		
Phase conductor to ground elevation:	N/A	N/A
Neutral conductor to ground elevation:	N/A	N/A
Communication conductor to ground elevation:	N/A	N/A
Phase conductor to structure:	N/A	N/A
Neutral conductor to structure:	N/A	N/A
Communication conductor to structure:	N/A	N/A
B. AT LOWEST POINT OF SPAN		
Phase conductor to ground elevation:	N/A	N/A
Neutral conductor to ground elevation:	N/A	N/A
Communication conductor to ground elevation:	N/A	N/A

C. SPAN LENGTH N/A

Date the line or facilities were constructed: 1975

Voltage of line or facilities: N/A

Date last inspected by utility: April, 1994

Utility: South Central Bell Telephone Company

Date: N/A Time N/A

Approximate temperature: N/A

Measurements made by: N/A

Submitted by:

ATTACHMENT NO. 1

Photo Mounting Sheet

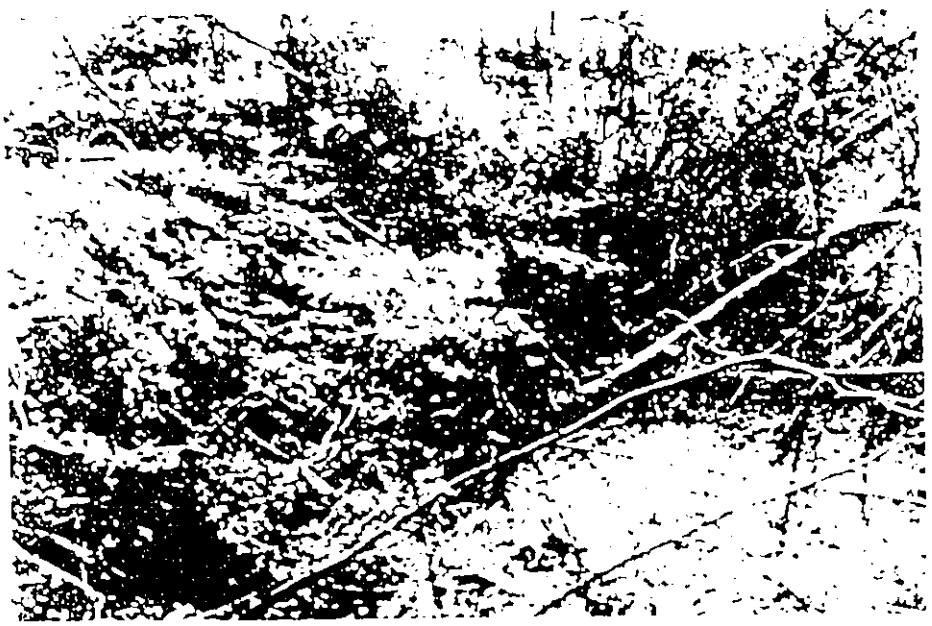


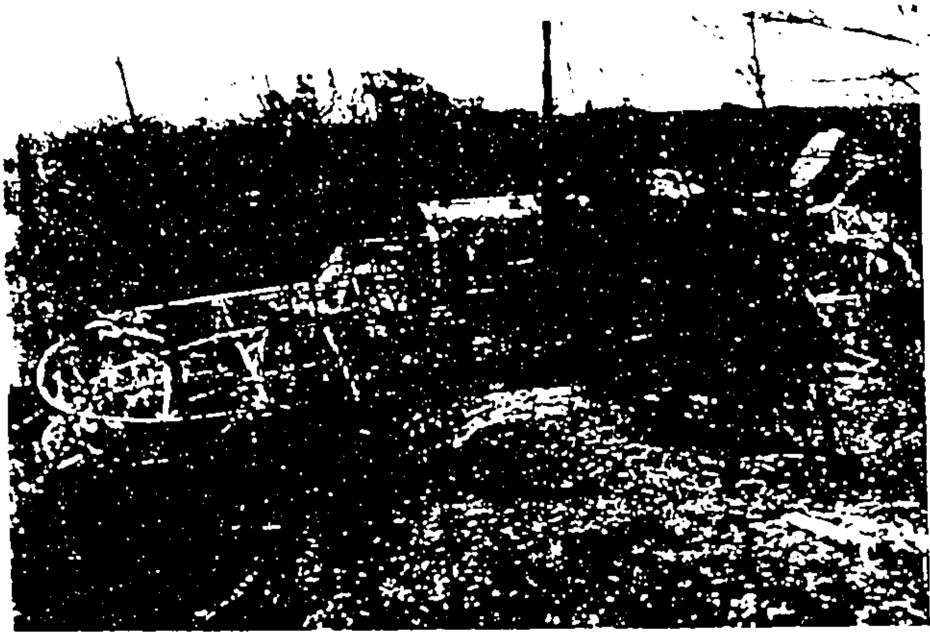
Photo Mounting Sheet

[illegible] SCB Microwave Tower, Jackson Ky April 26, [illegible]

James R. [illegible]nson

Date Taken

Signature



Picture Number

Description

[illegible]

Picture Number

Description

Road above Southeast anchor. A section of road has dropped approximately 3 to 4 feet.

ATTACHMENT NO. 2

INDUSTRY RELATIONS/REGULATORY
SOUTH CENTRAL BELL
Louisville, Kentucky

Following are 2 pages (not including this cover sheet)

TO: Jim Johnson

Telephone: _____

Fax: 564-1582

Jim - In reference to Jackson Radio Tower

FROM: Beth Ice
Manager--Regulatory
601 W. Chestnut, 4SW
Louisville, KY 40203
Fax: (502) 582-8667

✓ Please notify the recipient that a faxed message is waiting.

If you experience any problem with this fax, please call Beth Ice at (502) 582-8672.

Thank you

I N T E R O F F I C E M E M O R A N D U M

Date: 17-Apr-1994 07:05pm CST
From: William Robertson
ROBERTSON_WJ
Dept: Network Operations
Tel No: (502)582-1540

TO: MCCULLAR, TERRY (MCCULLAR_T @ A1 @ ALTE)

CC: 6 'CC' addressees

Subject: Jackson KY Radio Failure

Terry,

The following represents our first attempt at a sequence of events associated with the Jackson, KY radio tower disaster:

04-16-94	Saturday
0545(e)	Radio site failed; Alarms came in to Beattyville.
0600	Dispatched radio ET to Beattyville.
0620	Dispatched Phil Campbell, C.C. supervisor to Beattyville.
0730(e)	Investigation of alarms revealed trouble to be at the Jackson radio repeater end.
0840	Technician arrived at Jackson and discovered that the radio tower had collapsed; tower was destroyed and the building suffered damage.
0845 - 1030	Notified KY & HQ EOC, NSAC, PPSM, C&EA, OSPE, NP&E and Security.
1030	Conference call involving all interested parties, including David Lee from HQ Transmission, to assess situation and begin restoration plans. SS7 links on simplex, Danville & Winchester in critical mode. All major IEC's notified of the situation.
1300	AT&T tower restoration group actively involved and assessing possible response scenarios.
1400	Middlesboro - Winchester DS3 rerouted. Ordered plugs to be flown in from GA & NC to reroute the other 9 DS3's.
1500	Arrangements completed with AT&T tower restoration group to obtain temporary tower. Tower to be sent via truck from Atlanta, ETA 12pm EDT Sunday. (Some difficulty regarding a Teamsters strike)

1600 Confirmed availability of WFA-C & TIRKS with the data center.

1700 Picked up plugs at Lexington Bluegrass Field to complete rerouting of DS3's.

1800 Cranes, lights and bulldozer sent from Louisville to accomplish cleanup of repeater site.
Arranged for security to guard site overnite.

1930 Hazard - Lexington DS3 rerouted.

2150 Hazard - Winchester DS3 rerouted. Hazard isolation broken.

2300 All remaining DS3's rerouted. Isolation continues for Jackson and Leslie County Telephone Co.'s Canoe & Buckhorn exchanges. All SS7 links returned to duplex mode.

04-17-94 Sunday

0348 T1 span established to Jackson, restoring 1 of 3 switch mods, and partially breaking the isolation. (Analysis by the Frankfort SCC determined that switch mod 6 contained practically all of the critical service customers.)

0750 AT&T tower restoration crew begins arriving. AT&T commences evaluating possible restoration sites with Telco personnel. ETA of truck transporting temporary tower still set at 12 noon.

0900 - 1200 Unstable soil conditions threatening restoration plan. AT&T and Telco personnel continuing to evaluate restoration scenarios and investigate alternate site possibilities.

1200(e) Truck carrying temporary restoration tower is at Jackson.

1400 AT&T agrees to construct temporary tower on existing site. Extraordinary measures will be required to ensure the stability of the installation, including footers and retaining walls to reinforce guys. Construction of the tower can't begin until demolition and removal of old tower and temporary repairs to the building are completed, since the cranes required for this effort are occupying the site required for construction.

1510 Truck containing DS1 satellite uplink equipment arrives in Jackson. This equipment to be deployed at a prominent strip mall in Jackson to offer public telephone access to the network.

1625 All metal wreckage from the old tower has been removed. Work is commencing on removing the precast concrete roof of the building which has suffered damage.

1740 Concrete roof has been successfully removed. Work is beginning to affect repairs to secure the building.

1900 Thacker & Grigsby Telephone Co. has offered two DS1's from their cell site to us. Telco personnel are working to establish T1 spans to the repeater site. Upon completion of these spans we will be able to break the isolation experienced in the Leslie County Telephone Co.'s Canoe & Buckhorn exchanges and to reduce the partial isolation still in effect in the Jackson exchange. The T1 spans should be completed sometime this evening, and Thacker & Grigsby personnel will work with us in the morning to transfer service to their DS1's.

We still expect to meet the initial estimate for temporary service restoral given in the initial abnormal service condition report (Wednesday).

If you have any questions please call Bill Robertson or Susan Truitt in the KY EOC.

4/19/94 Isolation between Canoe + Buckhorn should be cleared today Thacker Grigsby To complete work by 11:00 pm. SCB will complete by 12:30 PM

ATTACHMENT NO. 3

LAW
ENGINEERING AND ENVIRONMENTAL SERVICES

April 26, 1994

Mr. Doug Gregg
South Central Bell
601 West Chestnut Street Floor 3NW
Louisville, Kentucky 40202
(502) 582-2143

Preliminary Failure Evaluation
MICROWAVE REPEATER TOWER GLC 52341
Jackson, Kentucky
Law Engineering Project Number 712.94.896

Dear Mr. Gregg:

We are presenting you with our preliminary findings regarding probable causes of the collapse of the above referenced telephone communications tower as you requested. This work is being performed in accordance with our work authorization, dated April 18, 1994 which was signed by you on April 18, 1994, and in accordance with our agreement Number BR-0412, for engineering and environmental consulting, between Law Companies Inc. and Bell South Telecommunications Inc. dated March 1, 1994.

BACKGROUND INFORMATION

The subject repeater tower site is located on a east-west trending ridge, about 500 feet to the south of Town Hill Road, about one mile to the west of downtown Jackson, Kentucky. The tower base elevation is about 1190 feet mean sea level (msl).

We understand the subject tower was erected in 1975. The tower was a 330 foot tall guy supported structure with a steel lattice frame mast. This tower utilized three sets of four guy cables; located due west, 30 degrees east of north, and 30 degrees east of south from the tower mast. Two cables of each set were anchored at outer and inner guy anchor locations located very roughly about 180 and 330 feet from the tower base. We understand that all of the anchors consisted of concrete deadman. We understand the specified minimum burial depth to the top of the deadman was 6 feet. The deadman dimensions were specified as 4 feet high, 4.5 feet deep and 6 feet wide. Structural load information regarding the tower is was not available as of this writing. We were unable to determine if a geotechnical exploration was performed for this tower site.

LAW ENGINEERING, INC.
2025 LEESTOWN ROAD STE 5
LEXINGTON KY 40511

606-255-3308
FAX 606-254-2327

We understand that the tower collapse occurred on Saturday, April 16, 1994 at about 6:00 AM. The supposed mode of collapse was buckling of the mast near the center with the upper half of falling to the west; however, no eye-witnesses of the collapse have been identified. We also understand that inspection of the wreckage indicated that a clevis pin at the inner west guy anchor was found to have been sheared off at the anchor rod connection. Heavy thunderstorms with about 2 inches of rainfall had occurred during the previous afternoon and evening and much above normal rainfall had occurred over the past three months.

SITE SURFACE CONDITIONS

We visited the tower site on Monday, April 18, 1994 to observe geotechnical conditions which may have contributed to the existing tower collapse, and to provide technical opinions regarding the placement of new guy anchors for a temporary restoration tower.

General

The tower site is situated in a shallow saddle on a narrow ridge line running westward from a local summit located about 600 feet to the east and about 120 feet higher than the tower site. Steep, wooded slopes ranging from 1H to 1V to 2H to 1V (horizontal to vertical) descend about 350 vertical feet to the north and south, a wooded, nearly level ridge top continues for about 1800 feet to the west, and a moderately sloping, thinly wooded, rocky ridge line runs to the summit to the east. The guy anchors are located on the ridgetop to the west, on steep slopes below the rocky ridge line to the northeast, and on steep slopes at the head of a deep hollow to the southeast. A gravel surfaced roadway runs eastward from the tower site. This road skirts the steep slope to the southeast of the tower site and passes about 50 and 100 feet to the north of the inner and outer southeast guy anchors respectively. This roadway provides access to a newer communications tower constructed on the summit to the east.

Guy Anchors - Southeast

Several obvious slope failures appeared to have recently occurred in the vicinity of the gravel roadway and the southeast guy anchors. These slope failures appear to be part of an extensive landslide area extending roughly 400 feet eastward from the vicinity of the tower base and about 500 feet down slope. This landslide area appears to consists of numerous individual overlapping slope failures which appear to have been occurring over an uncertain period of time. Bent tree trunks were also noted to be widespread over most of the southeast side of the ridge. Bent tree trunks often indicate slopes which are historically unstable or marginally stable.

The most recent slope failure appears to have occurred within the previous few days. This failure resulted in a scarp up to 4 feet in height which made the roadway impassable. The ground surface below this scarp, including both southeast anchor locations was extensively fissured into tilted blocks with numerous tilted and several felled trees. A 5 to 6 foot high ground surface bulge with numerous fissures appears to be present on the slope 30 to 60 feet

below the anchor locations. Also, a 20 foot wide, 3 to 5 foot deep lobe of recently fluid mud extended about 100 feet down slope from the toe of the recent slope failure. This most recent slope failure appears to be superimposed on several older slope failures which extended further down the slope. Other relatively recent slope failures appear to have occurred immediately to the east and west of this slope failure.

The general geometry and the magnitudes of the ground movement at the slope failures were difficult to visually estimate due to heavy undergrowth and piles of discarded appliances in the slope failure area; however, based on our observations, the slope failures appear to be typical "rotational" failure surfaces. These failures are characterized by movement of the soil mass on a concave-up slip surface. Recent down-slope ground movement of at least 5 to 10 feet appears to have occurred in the vicinity of both anchor locations.

The southeast guy anchors were also checked for any evidence that the anchors did not move with the slope movements. The possibility existed that the slope failure was sufficiently shallow as to not involve the deadman anchors. However, the ground surface where the anchor rod exited the ground was found to be undisturbed and no evidence of differential movement of the anchor relative to the ground was observed. Therefore, based on our visual observations, the southeast deadman anchors appear to have moved at least 5 to 10 feet to the south. Actual anchor movements will be available pending our reciept of a survey performed by CDP Engineers, who we retained for the survey work on this project.

Guy Anchors - West and Northeast

The vicinity of the west and northeast guy anchors were visually observed for evidence of ground movements or anchor puilout failure. No evidence of ground movement or pullout failure were observed. Some evidence of historical slope instability in the form of bent tree trunks and an irregular ground surface was evident on steep slopes to the north and northeast of the northeast guy anchors.

SITE GEOLOGY

Publishes geologic data indicates the tower site is located in the Eastern Kentucky Coal Field Physiographic Province. The Eastern Kentucky Coal Field consists of an ancient plateau which has been erosionally dissected into a rugged terrain of steep hills and generally narrow valleys. Topographic relief in the Jackson area ranges from about 400 to 700 feet. The entire region is underlain by the interbedded sandstones, siltstones, shales and coal seams of the Breathitt Formation. Stream valleys are filled with a variable thickness of alluvium which consists of generally soft clay and silt or loose sand with some gravel. Also, slopes are often mantled with a variable thickness of colluvium which typically consists of a mixture of sand, silt, clay cobbles and boulders derived from weathering of up-slope bedrock ledges. This colluvium has been reported to as thick as 30 feet in some areas. These colluvial materials are often in a wet and loose condition as a result of springs up-slope. Slope stability problems often occur when

roadways or other construction is attempted in wet colluvial materials.

We also performed a geologic reconnaissance of the tower site in order to obtain site-specific geologic information which may affect our findings. Sandstone appears to underlie the rocky ridge to the east of the tower site and appears to be predominant bedrock type above the 1200 foot msl contour. Shale appears to be the predominant bedrock at the tower site and much of the sloping land below the tower site. Deadman anchor excavations indicated about 6 to 8 feet of residual soil covered the shale bedrock along the west trending ridgetop.

A 14" to 18" thick coal seam was observed above the landslide area at the elevation of the gravel roadway, which roughly follows the 1180 foot contour. This coal seam was overlain by an irregular sandstone bed and was underlain by a highly plastic underclay. Several springs and seeps were noted along this coal seam. This seepage collected in the roadside ditches where it was conveyed to the landslide area.

The landslide area appeared to be mantled by a colluvial deposit consisting of clayey sand intermixed with weathered sandstone cobbles and occasional boulders. This colluvium was in a wet to saturated condition with ponded water observed in the fissures in the slope failure area. The thicknesses of this colluvium could not be determined but appeared to be at least 10 to 15 feet thick in some places based on observations in slope failure area.

DISCUSSION AND FINDINGS

Our observations indicate that the likely immediate cause of tower collapse was overloading of the tower structural components, caused by large outward movements of one or both of the southeast deadman anchors. These deadmen moved due to an extensive slope failure of the hillside in which these deadmen were founded. This slope failure was clearly large enough that the pulling force on the southeast guy cables was limited only by the ultimate capacity of the deadman anchors. The anchor capacities are typically conservative and would likely have exceeded the strength of the guy cable hardware or other parts of the tower structure. Therefore, the mode of structural failure, including the shearing of the guy anchor clevis pins appears to be consistent with this cause of the failure.

The cause of the slope failure is less well defined. The immediate, short term event that precipitated the slope failure was the very heavy rainfall the previous evening which was preceded by above normal precipitation. This is a very typical situation; nearly all slope failures are preceded by heavy rainfall. The rainfall saturates the soil and adds additional weight to the slope. More importantly, water seepage within the soil mass increases pore water pressures which greatly decreases the soil strength. The unusually heavy rainfall and snowfall during the first three months of 1994 have resulted in much above normal landslide occurrences over most of the Eastern Kentucky.

The longer-term causes of many slope failures are construction activities on existing minimally stable slopes which steepen, overload, or alter the surface or subsurface drainage of the slope. We suspect that the construction of the roadway up-slope from the southeast deadman anchors contributed to the instability of the slope by impeding the slope drainage and possibly altering water drainage from the springs associated with the coal seam at this road location. Construction of this roadway also resulted in steepened slopes uphill from the deadmen anchors. We understand this road was constructed by others several years after the tower was erected. Therefore, the deleterious impact of this road would have been very difficult to anticipate or prevent.

Repair and stabilization of large failing slopes are typically quite costly and must be properly designed after a thorough geotechnical exploration. Typical stabilization measures for failing slopes require the construction of earth retaining structures using piles or piers seated an adequate depth below any potential failure surface, and the use of tieback anchors to resist toppling forces. Inadequately designed retaining structures result in continuing slope failures.

The relocation of any foundations away from potentially unstable slopes is the most economical option for communication tower facilities.

Law Engineering appreciates this opportunity to provide our services and we look forward to serving as your geotechnical consultant on this and future projects. Please contact us if you have any questions regarding the information presented.

Sincerely,
LAW ENGINEERING, INC.

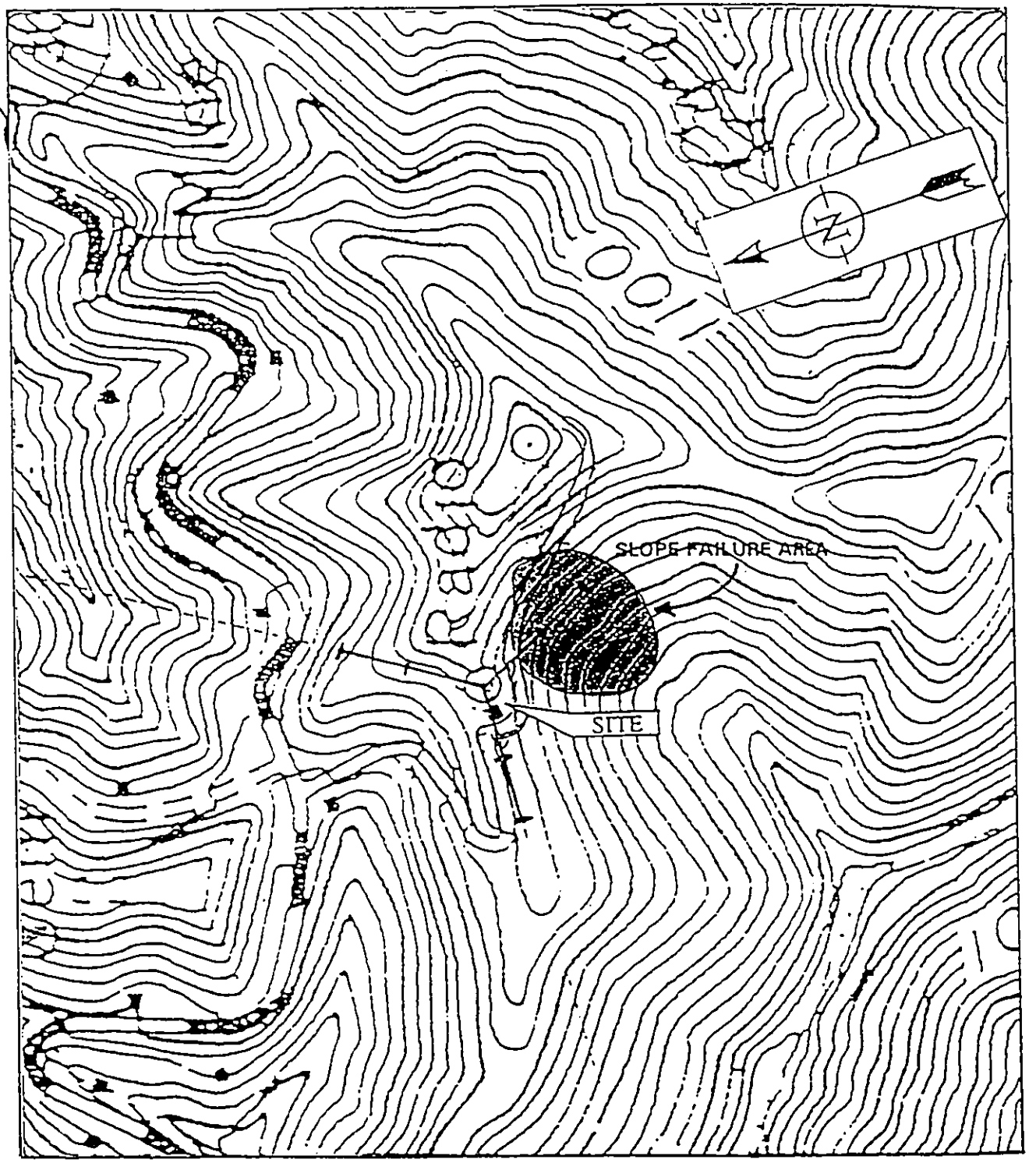
Paul J. Donahue E.I.T.
Geotechnical Engineer

Wayne A. Karem
Principal Engineer
Registered Kentucky 15058

PJD/WAK/pjd/71289601.04

BY _____ WITH PERMISSION

Attachment: Site Vicinity Map



SOURCE: USGS Jackson Quadrangle, 1978

SITE VICINITY MAP
MICROWAVE REPEATER FACILITY
JACKSON, KENTUCKY

SCALE 1" = 350'	APPROVED BY	DRAWN BY
DATE 4-21-94		REVISED

SOUTH CENTRAL BELL
LOUISVILLE, KENTUCKY

Law Engineering | DRAWING NUMBER 712.94.896-

April 26, 1994

Mr. Doug Gregg
South Central Bell
601 West Chestnut Street Floor 3NW
Louisville, Kentucky 40202
(502) 582-2143

Approximate Cable stress Calculations
MICROWAVE REPEATER TOWER
GLC 52341
Jackson, Kentucky
Law Engineering Project Number 712.94.896

Dear Mr. Gregg:

We performed a rough estimate of the pulling force on southeast guy cables due to the anchor movement of anchors B-1 and B-2. Structural information is not currently available to us therefore we used a very rough estimate of the cable size and geometry as follows:

Cable Diameter:	1"
Uppermost Cable Length:	475 feet
Uppermost Cable Angle from Anchor:	50 degrees from Horizontal
Lowermost Cable Length:	225 feet
Lowermost Cable Angle from Anchor:	28 degrees from Horizontal
Ultimate Strength of Cables:	200,000 lbs.

Based on the above information the theoretical amount of tension that would be caused by the anchor displacement depicted on the guy plan by CDP Engineers, dated April 29, 1994, would be as follows:

- Uppermost Cable: 210,000 pounds
- Lowermost Cable: 425,000 pounds

Since the strength of 1" cables would be only be 200,000 pounds, the cables or cable hardware would break before these loads are reached.

Please note that this estimate is very rough and based on estimated values and our calculations have not been subject to engineering review or checking.

We hope this information will be useful. Please contact us if you have any questions regarding the information presented.

Sincerely,
LAW ENGINEERING, INC.

Paul J. Donahue E.I.T.
Geotechnical Engineer

ATTACHMENT NO. 4

R.L. Cave
Regional Manager - External Affairs

GTE Telephone Operations
South Area

KY999076
318 East Main Street
Post Office Box 1650
Lexington, KY 40592
606 233-4251

April 27, 1994

Mr. James Johnson
Kentucky Public Service Commission
730 Schenkel Lane
P.O. Box 615
Frankfort, Kentucky 40602

Dear Mr. Johnson:

GTE South experienced a toll outage on April 16, 1994, due to the failure of a radio tower in the territory of South Central Bell. At approximately 5:30 a.m. on the morning of April 16 all long distance communications was lost for the GTE exchanges of Hazard, Leatherwood and Vicco.

By 7:30 p.m. on April 16 GTE had restored approximately 90 per cent of the facilities by rerouting the long distance facilities. This outage effected about 12,050 customers in the three exchanges.

If you need any additional information please do not hesitate to contact me.

Very truly yours,

R. L. Cave

RLC:pcm